

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:  
Ashok ADUR, Zengli FU, and Roger AVAKIAN

§371 Serial No.: 10/567,292  
§371 Date: February 6, 2006  
PCT Serial No.: PCT/US2004/023203  
Filed: 19 July 2004 (19.07.2004)

Examiner: R Boyle

For: CATALYST SYSTEMS FOR  
ELASTOMER COMPOSITIONS

**VIA EFS-WEB**  
**Conf. No. 6750**

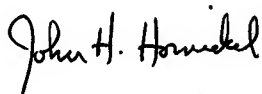
**Appeal Brief**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

Appellants file their appeal brief from the Office Action, made final, mailed on June 26, 2009. Appellants will have paid the filing fee as a part of the EFS-Web filing process. If any other amount is required, the Office is authorized to charge Deposit Account No. 07-1077.

Respectfully submitted by:



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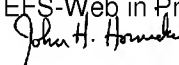
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I hereby certify that this paper is being transmitted to the United States Patent and Trademark Office on the date shown below to the EFS-Web in Private PAIR:

November 24, 2009

Signed

Date

  
John H. Hornickel, Reg. No. 29,393

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### **REAL PARTY IN INTEREST**

This application is assigned to PolyOne Corporation, a corporation organized under the laws of the State of Ohio and having its headquarters at 33587 Walker Road, Avon Lake, Ohio 44012.

### **RELATED APPEALS AND INTERFERENCES**

Appellant, his Assignee, and its Legal Representative do not know of any other prior or pending appeals, judicial proceedings or interferences which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

### **STATUS OF CLAIMS**

Claims Rejected: 1, 3, and 9-13

Claims Canceled: 2, 4-8

Claims Allowed: None

Claims Withdrawn: None

Claims Objected To: None

Claims 1, 3, and 9-13 are on appeal.

### **STATUS OF AMENDMENTS**

No Amendments are pending. The Claims in the Appendix embody this status.

### **SUMMARY OF CLAIMED SUBJECT MATTER**

Independent Claim 1 concerns a thermoplastic vulcanizate (“TPV”) of polypropylene (“PP”) and ethylene-propylene-diene rubber (“EPDM”). (Page 3, Line 6; Page 8, Line 23; and Page 9, Line 16). The TPV is formed in the presence of a catalyst system. (Page 3, Lines 28-30). Via amendments, the catalyst system now comprises at least one non-brominated phenolic resin, at least one non-transition metal halide from a list of four, and oxalic acid or citric acid. (Page 4, Line 10; Page 6, Lines 13-19; and Page 6, Line 29). Optionally, the catalyst system also includes a hydrogen halide scavenger. (Page 7, Line 7). The sole dependent Claim 3 identifies a preference for the phenolic resin to have methylol groups. (Page 4, Line 27)

Independent Claim 9 concerns a method of making a TPV of PP and EPDM employing five steps of (a) providing catalyst system (Page 13, Line 20); (b) providing PP or its precursors (Page 15, Line 27); (c) providing EPDM (Page 15, Line 4); (d) mixing the ingredients of PP, EPDM and catalyst system (Page 15, Line 26 – Page 17 – 10); and (e) heating the mixture to cure the EPDM and form the TPV (Page 17, Lines 11 – 15). Claim 9 continues with an identification of the catalyst system matching the language of Claim 1, summarized with support above. Dependent Claim 10 adds that the phenolic resin is present in about 2 to about 10 percent by weight. (Page 14, Line 5). Dependent Claim 11 adds that reactive extrusion is used (Page 16, Lines 24-25). Dependent Claim 12 adds that the halide is present in about 2 to about 8 percent by weight. (Page 14, Line 12). Dependent Claim 13 adds that the acid is present in about 1 to about 5 percent by weight. (Page 14, Line 23).

### **Grounds of Rejection to be Reviewed on Appeal**

1. Claims 1, 3, and 9-13 were rejected under §103(a) by using U.S. Pat. No. 4,311,628 (Abdou-Sabet et al.) in view of U.S. Pat. Nos. 3,578,614 (Wszolek) and 5,145,913 (Gerber).
2. Claims 1, 3, and 9-13 were rejected under §103(a) by using U.S. Pat. No. 3,287,440 (Giller et al.) in view of U.S. Pat. No. 3,578,614 (Wszolek)

### **ARGUMENTS**

1. **Claims 1, 3, and 9-13 were rejected under §103(a) by using U.S. Pat. No. 4,311,628 (Abdou-Sabet et al.) in view of U.S. Pat. Nos. 3,578,614 (Wszolek) and 5,145,913 (Gerber).**

First, there is no anticipation rejection in this appeal. So the claimed invention is novel. This is important because of the nature of the technology and the advance in the state of the art by the claimed invention.

Appellants have invented a fundamentally new way of curing the EPDM component of a TPV. Appellants have avoided the use of transition metal halides and the problematic and controversial environmental and human health issues of using transition metal halide catalysts.

Abdou-Sabet et al. taught the use of a phenolic curing agent and a cure activator. Of the halide cure activators taught, only stannous chloride and ferric chloride are mentioned. Certainly none of those claimed by Appellants: magnesium chloride, calcium chloride, sodium chloride, potassium chloride are mentioned by Abdou-Sabet et al. Moreover, Abdou-Sabet et al. fails to teach or suggest the use of citric or oxalic acid. Abdou-Sabet et al. represents an earlier age, circa. 1979 – thirty years ago, when environmental issues about transition metal halides were less well known.

With those gaps in Abdou-Sabet et al., the Office appends an even older patent, Wszolek, which mentions the curing rate acceleration attributes of alpha-hydroxy-

carboxylic acids. But the Office can not shake from Wszolek the reality that it teaches these acids to accelerate the curing rate of polythiols, not EPDM.

Appellants do not claim their use of citric acid and oxalic acid is new to the world as curing rate accelerators, just to EPDM. Wszolek is an improper secondary reference, because it is incongruous that a person having ordinary skill in the art (PHOSITA) would be led to fill the gaps of Abdou-Sabet et al. with Wszolek. Where is the connection between these two references? The Office lumps EPDM and polythiols into the category of “elastomeric compositions,” a convenience built upon perfect vision of hindsight which the Office is discouraged in which to engage.

During examination, Appellants challenged the nature of the combination rejection as an “aggregation” of references, to which the Office responded that Appellants can not attack the references individually. The inverse is also true; the Office can not reject patentable claims without a legally justifiable reason to connect the secondary reference to fill in the gaps of the primary reference. Here, PHOSITA would not be encouraged by anything in Wszolek to suddenly solve the gaps in Abdou-Sabet et al. to advance the art away from transition metal halides in a phenolic curing system for EPDM. There is a reason for that: Wszolek was making adhesives<sup>1</sup>!!! What PHOSITA moves from adhesives to TPVs without an unobvious thunderbolt striking her or him?

Appellants have the same problem with the connectivity which the Office has asserted between Abdou-Sabet et al. and Wszolek with Gerber. Gerber does not teach the curing of EPDM. Gerber teaches the curing of phenolic resins<sup>2</sup>. Abdou-Sabet et al. are *using* phenolics to cure EPDM. The Office acknowledges this but considers “controlling phenolic curing rates” to make Gerber analogous art. How? Appellants do not want to “control” phenolic curing rates; Appellants want to *use* phenolic resins to cure EPDM *as rapidly and inexpensively as possible*. Time is money; Gerber is teaching how to slow down curing rates for phenolic resins. That is the inverse of analogous art.

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<sup>1</sup> “solid, crosslinked, three dimensional network polythioether polymer system upon curing.” (Col.6, Lines 49-54).

As a reminder from KSR, “When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.” (Emphasis Added) The curing of EPDM elastomer into a vulcanizate can not be considered “predictable.” PHOSITA would not be encouraged by the *aggregate* of Abdou-Sabet et al., Wszolek (polythiol-based adhesives), and Gerber (phenolic shoe soles) to even *try* the combination which Applicants have invented. Applicants are entitled to the grant of a patent as a reward for their unobvious advancement in their field of endeavor.

**2. Claims 1, 3, and 9-13 were rejected under §103(a) by using U.S. Pat. No. 3,287,440 (Giller et al.) in view of U.S. Pat. No. 3,578,614 (Wszolek)**

The situation is hardly better in the combination of Giller et al. and Wszolek. We already know that Wszolek focuses PHOSITA on curable polythioester adhesives from polythiols and polyenes (of which EPDM<sup>3</sup> is one type).

Appellants recognize Giller et al. to be seminal technology to the art of phenolic curatives for ethylene-propylene terpolymers<sup>4</sup>. But Giller et al. did not recognize the use of citric or oxalic acid to assist the curing. The Office can not pick and choose specific passages from Wszolek about such acids without taking the rest of the teaching of Wszolek to overlay on Giller et al., as PHOSITA would, to see if anything positive and valuable would come out it.

PHOSITA had 30 years to see something positive and valuable from Giller et al. (1966) + Wszolek (1971) and found nothing. Even Abdou-Sabet et al., which cited Giller et al. approvingly did not see the value of the teaching of Wszolek to add to what Giller et al. did not have. What better PHOSITA exists than Abdou-Sabet et al., in 1979, the pioneer of the technology which became the best selling TPV in the world?

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<sup>2</sup> Indeed, Gerber is teaching the *retarding* of the curing of phenolic resins. Any acceleration of curing would be counter to what Gerber wants.

<sup>3</sup> This is about the only connection between Wszolek and Appellants' invention.

<sup>4</sup> Even Abdou-Sabet et al. cites Giller et al.

Fast forwarding to 2003, when Appellants filed their priority application, no one in the ensuing quarter-century had advanced the state of the art of Abdou-Sabet et al. in respect of the types of curing systems, which Abdou-Sabet et al., the putative PHOSITA, failed to see. No one but Appellants,<sup>5</sup> 37 years after Giller et al. and 24 years after Abdou-Sabet et al.

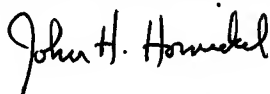
In those ensuing years, transition metal halides became a problem, and someone needed to solve that problem without compromising the reason for curing EPDM in the first place. The catalyst system needed to work as well or better than what it was to replace. Appellants did that.

The situation is not theoretical; there has been a long felt need for different curing systems for TPVs of PP and EPDM, which Abdou-Sabet et al. pioneered 30 years ago. Avoiding the use of stannous chloride is not merely theoretical. Appellants have advanced the state of the art, patentably so. Examples 107-110 show actual reduction to practice using the catalyst system now claimed in Claims 1 and 9. Appellants have promoted the progress of the useful arts of TPV preparation and should be rewarded for revealing those details into American commerce.

### **Conclusion**

Appellants' Claims 1, 3, and 9-13 satisfy the requirements of the patent law. Appellants respectfully request the Office to be directed to issue a Notice of Allowance for Claims 1, 3, and 9-13.

Respectfully submitted by:



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<sup>5</sup> "One advantage of the present invention is avoidance of tin-containing catalyst systems to prepare elastomers, reducing environmental concerns." (Page 2, Lines 13-14)



## **CLAIMS APPENDIX**

1. A thermoplastic vulcanizate comprising polypropylene and EPDM prepared using a catalyst system comprising:
  - at least one non-brominated phenolic resin;
  - at least one non-transition metal halide wherein the halide comprises magnesium chloride, calcium chloride, sodium chloride, potassium chloride, or combinations thereof;
  - at least one acid selected from the group consisting of oxalic acid, citric acid, and combinations thereof; and
  - optionally, at least one hydrogen halide scavenger.
3. The thermoplastic vulcanizate of claim 1, wherein the at least one phenolic resin comprises methylol groups.
9. A process for making a thermoplastic vulcanizate comprising polypropylene and EPDM, the process comprising:
  - (a) providing a catalyst system;
  - (b) providing at least one thermoplastic polymer comprising polypropylene or precursors for at least one thermoplastic polymer comprising polypropylene;
  - (c) providing at least one uncured elastomer comprising EPDM;
  - (d) mixing components of the catalyst system, simultaneously or sequentially, with the uncured elastomer; and
  - (e) heating the uncured elastomer in the presence of the catalyst system to cure the uncured elastomer and to form the thermoplastic vulcanizate, wherein the catalyst system comprises:
    - (1) at least one non-brominated phenolic resin;

(2) at least one non-transition metal halide wherein the halide comprises magnesium chloride, calcium chloride, sodium chloride, potassium chloride, or combinations thereof;

(3) at least one acid selected from the group consisting of oxalic acid, citric acid, and combinations thereof; and optionally,

(4) at least one hydrogen halide scavenger.

10. The process of claim 9, wherein the amount of the phenolic resin used is about 2 to about 10 percent by weight based on total weight of the uncured elastomer.

11. The process of claim 9, wherein the thermoplastic elastomer is prepared using reactive extrusion.

12. The process of Claim 9, wherein the amount of the halide used is about 2 to about 8 percent by weight based on total weight of the uncured elastomer.

13. The process of Claim 9, wherein the amount of the acid used is about 1 to about 5 percent by weight based on total weight of the uncured elastomer.

**EVIDENCE APPENDIX**

None

**RELATED PROCEEDINGS APPENDIX**

None